

Joint Polar Satellite System (JPSS)

JPSS ATMS OVERVIEW

Mitch Goldberg

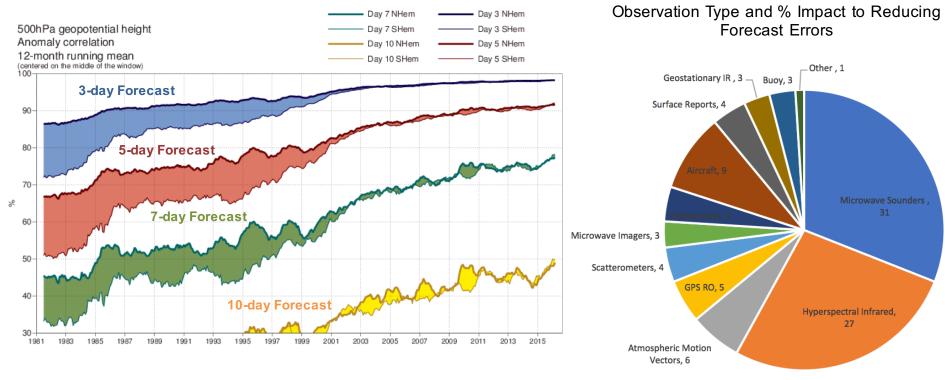
Program Scientist

Joint Polar Satellite System
National Environmental Satellite, Data, and Information Service
U.S. National Oceanic and Atmospheric Administration
U.S. Department of Commerce



Why polar? Why JPSS?

Microwave and Infrared Sounders have Huge Impacts in Forecasts



Credit: ECMWF



Advanced Technology Microwave Sounder (ATMS)

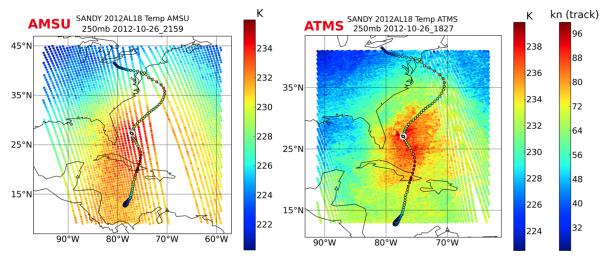
Sounding data provides:

- 3-D temperature and moisture profiles
- Rainfall rates
- Snow/ice information

Sounding data improves:

- Short- and medium-term forecasting
- Storm tracking

Resolution: ATMS vs. AMSU



Higher resolution—Wider swath—Much smaller gaps between passes



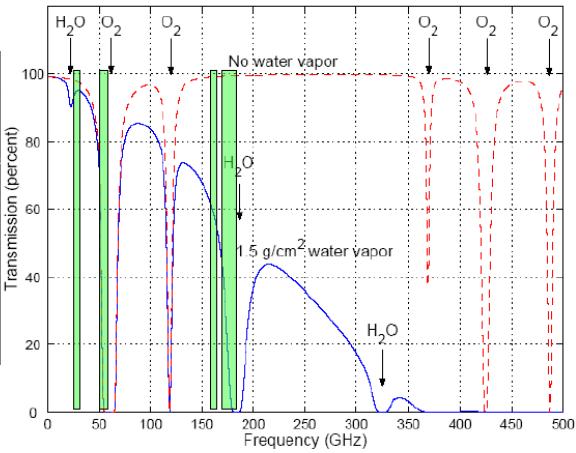


Rainfall rates during Hurricane Sandy



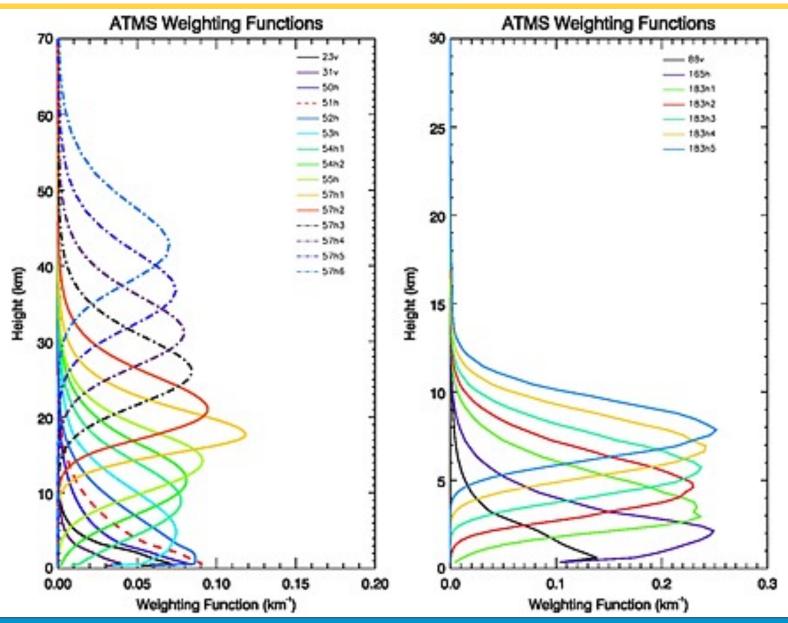
ATMS – channels are selected to observed atmospheric temperature, water vapor, surface emission, scattering







ATMS Weighting Functions





JPSS Program Data Products

VIIRS (26 EDRs) AP, RDR, SDR

Land Surface Temperature

Ocean Color/Chlorophyll

Quarterly Surface Type

Snow Cover

Surface Type

Polar Winds

Suspended Matter

Vegetation Indices

Green Vegetation Fraction

Sea Surface Temperature

Vegetation Health Index Suite

Sea Ice Characterization

EDRs

Active Fires Albedo (Surface) Aerosol Optical Thickness

Aerosol Particle Size Parameter

Cloud Base Height

Cloud Cover/Layers Cloud Effective Particle Size

Cloud Optical Thickness

Cloud Top Height

Cloud Top Pressure Cloud Top Temperature

Cloud Mask

Ice Surface Temperature

Imagery

CERES¹ AP, RDR

EDRs: Carbon Dioxide (CO₂) Carbon Monoxide (CO)

Infrared Ozone Profile

CrIS (5 EDRs)

AP, RDR, OSDR

Methane (CH₄)

Outgoing Longwave Radiation

CrIS/ATMS (2 EDRs)

EDRs: Atm Vertical Temperature Profile Atm Vertical Moisture Profile

ATMS (11 EDRs) AP, RDR, SDR, OTDR

Cloud Liquid Water Imagery Land Surface Emissivity

Land Surface Temperature Moisture Profile Rainfall Rate

Sea Ice Concentration Snow Cover Snow Water Equivalent Temperature Profile Total Precipitable Water

AMSR2 (11 EDRs)3 AP, RDR, SDR, TDR

EDRs:

Cloud Liquid Water Imagery Precipitation Type/Rate

Total Precipitable Water

Sea Ice Characterization Sea Surface Temperature

Sea Surface Wind Speed

Snow Cover/Depth **Snow Water Equivalent**

Soil Moisture

Surface Type

KEY

- Application Packet

RDR - Raw Data Record

SDR - Sensor Data Record

TDR - Temperature Data Record

EDR - Environmental Data Record Products with Key Performance Parameters

OMPS-Nadir (2 EDRs) OMPS-N AP, RDR, SDR

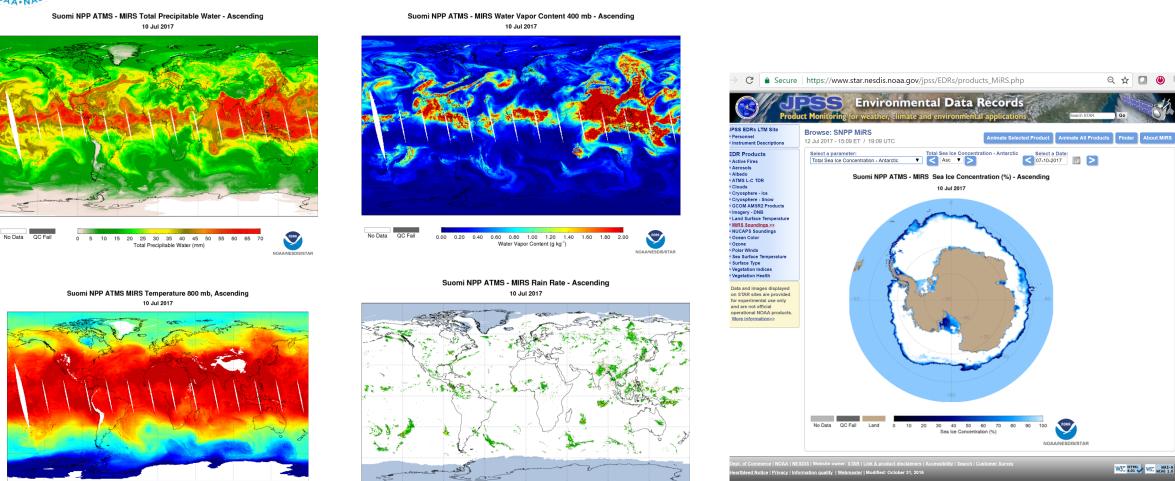
EDRs: O₃ Total Column

O₃ Nadir Profile

OMPS-Limb² OMPS-L AP, RDR

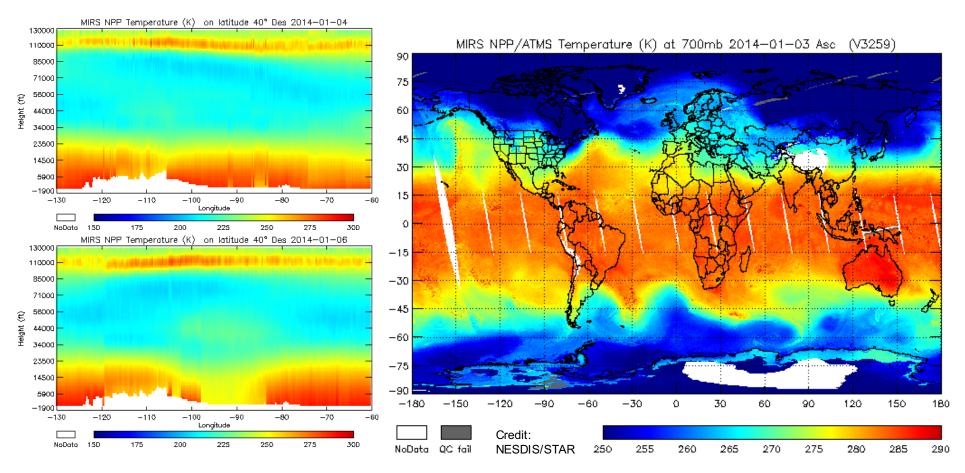


ATMS Products



https://www.star.nesdis.noaa.gov/jpss/EDRs/products_MiRS.php

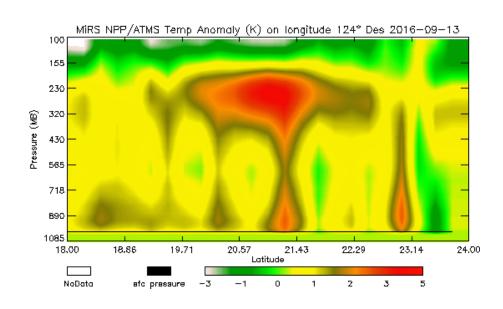
Example of lower tropospheric Temperature

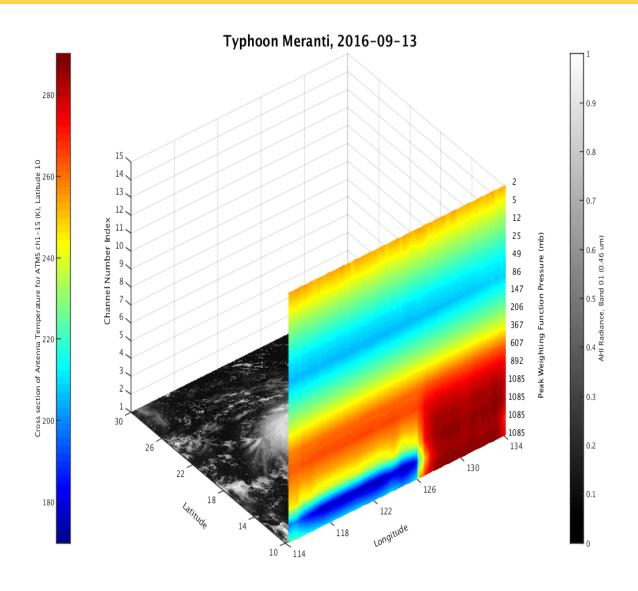


ATMS penetration of clouds reveals the transport of the Polar Vortex that impacted the US with large swath of record cold temperatures. The peak for DC area was 1/7/14. Above left are vertical cross-sections of temperature comparing January 4 with January 6, showing normal air temperature at ~ 23000 feet (-45 to -10 F, Winter) reached the surface on 1/6/14.



ATMS Measures Vertical Profiles

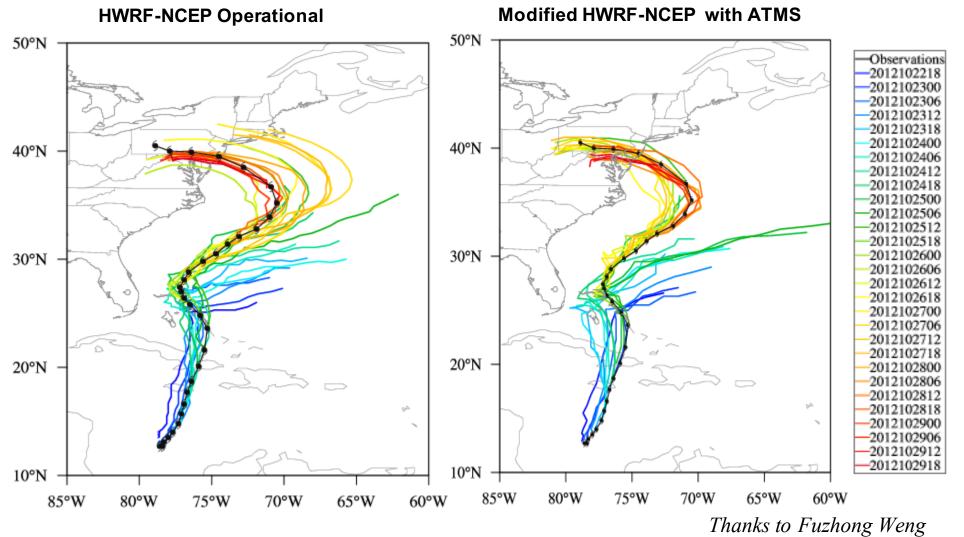




Direct Assimilation of ATMS into Models

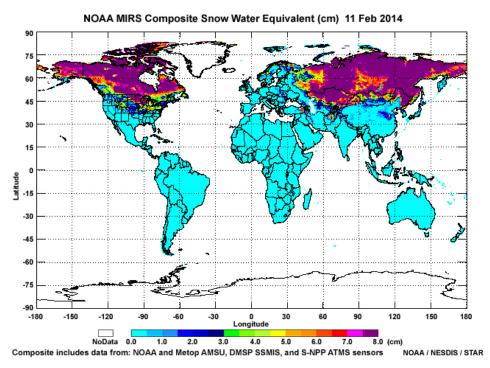


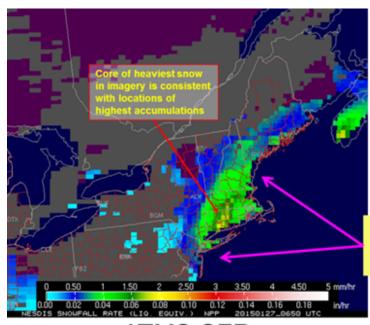
Experimental results showing improvements in Sandy track forecasts from Hurricane Weather Research Forecast model with ATMS

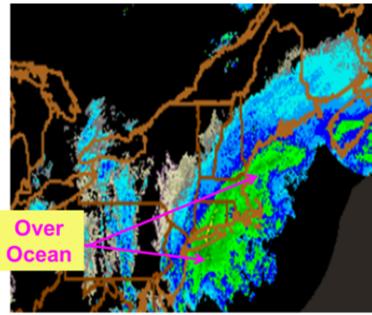




ATMS Monitors Snow







ATMS SFR

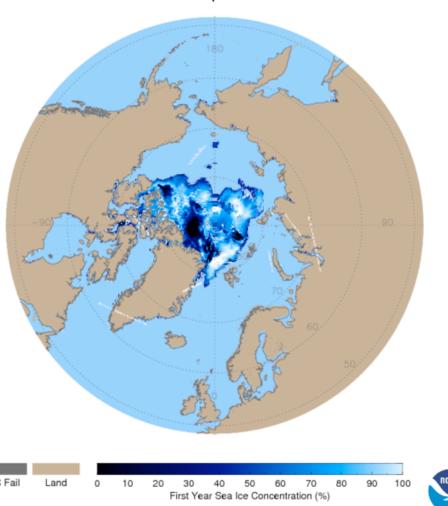
Radar Reflectivity



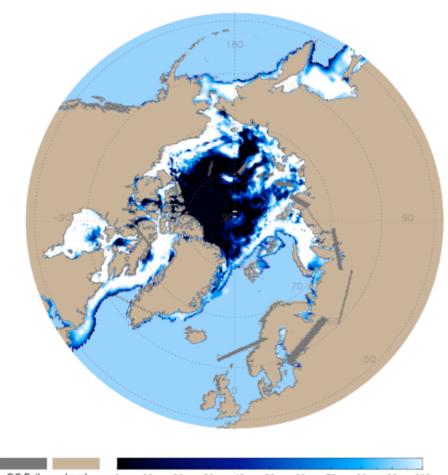
No Data

ATMS Monitors Ice

Suomi NPP ATMS - MIRS First Year Sea Ice Concentration (%) - Ascending 14 Sep 2016



Suomi NPP - ATMS - MIRS First Year Sea Ice Concentration (%) - Ascending
24 Feb 2016

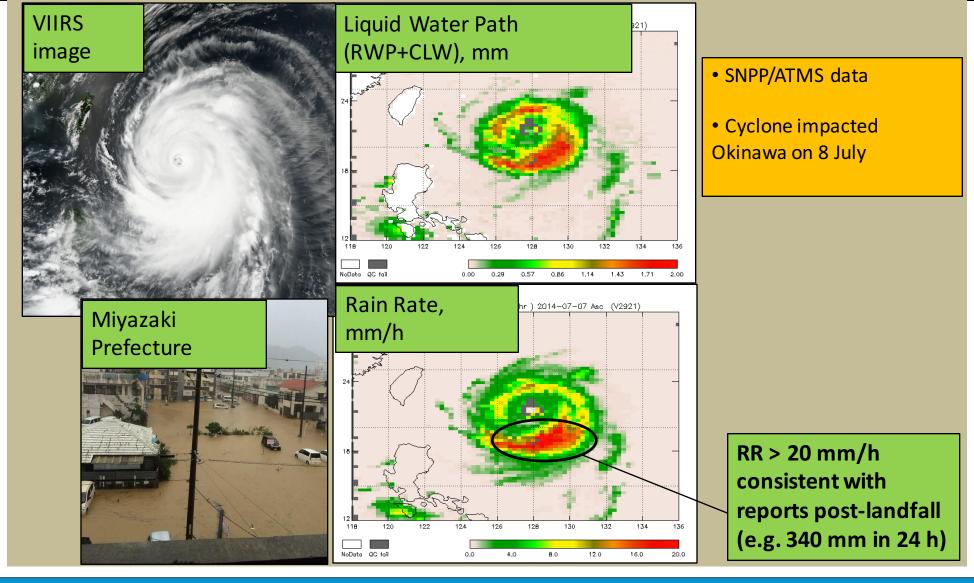


First Year Sea Ice Concentration (%)



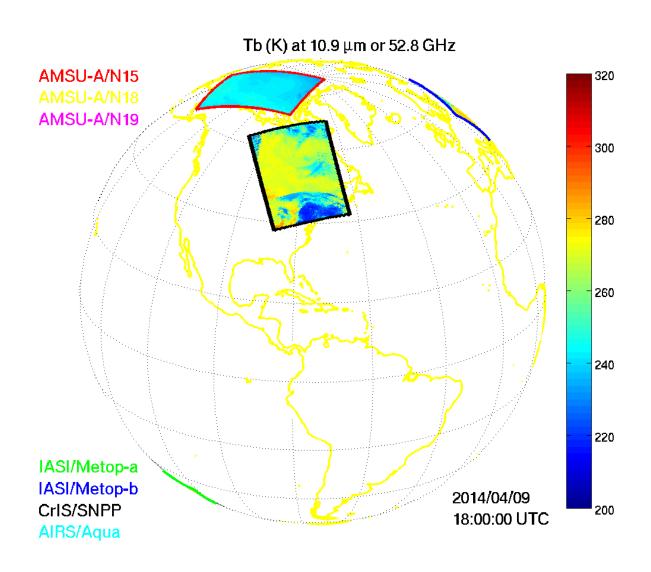
MiRS V11 Rainfall: Typhoon Neoguri on 7 July 2014





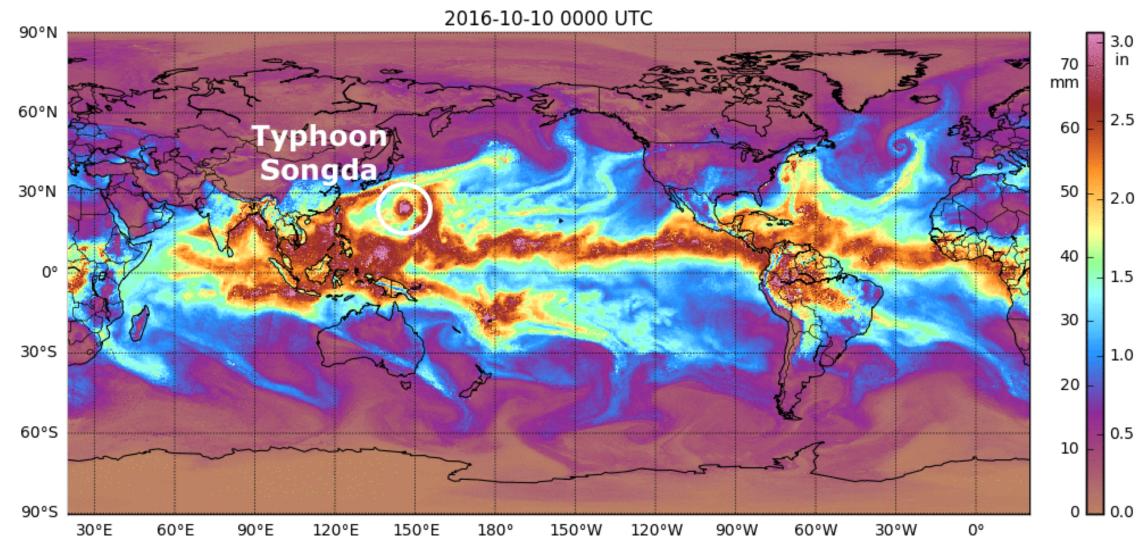


Multiple Orbits Create Better Coverage





Atmospheric Rivers from Microwave Sounders





Summary

ATMS and our legacy microwave sounders provides critical data for weather forecasting.

The microwave products are used for many nowcasting, hydrological and climate applications including:

Hurricane intensity

Rainfall rates

Snowfall rates and snow water equivalent

Snow and Ice monitoring

Long-term records of atmospheric temperature and water vapor.

MSU/AMSU-A Global Mean Layer Temperature Anomaly Time Series

